

CLAIMS:

1. A load-handling clamp adapted to be mounted upon the lifting apparatus of a lift truck, comprising:

- 5 (a) a frame adapted to be mounted upon said lifting apparatus so as to be selectively movable vertically by said lifting apparatus;
- 10 (b) first and second opposing clamping assemblies mounted upon said frame, the first clamping assembly comprising at least a pair of clamp arms movable separately from each other relative to said frame selectively toward and away from the second clamping assembly;
- 15 (c) a pair of bidirectional fluid power actuators each capable of moving a respective one of said pair of clamp arms selectively either in a closing movement toward said second clamp assembly or in an opening movement away therefrom;
- 20 (d) a hydraulic circuit connected to said actuators capable of selectively causing said closing movement of said pair of clamp arms in unison with each other while
- 25 said clamp arms are in respective synchronized positions relative to each

other and thereafter, automatically in response to a resistance to closing movement of one but not the other of said pair of clamp arms, causing closing movement of said other of said pair of clamp arms so that said pair of clamp arms assume respective unsynchronized positions relative to each other;

(e) said hydraulic circuit being capable of selectively causing opening movement of said other of said pair of clamp arms while said pair of clamp arms are in respective unsynchronized positions relative to each other so as to cause attainment by said clamp arms of respective synchronized positions relative to each other and thereafter, automatically in response to said attainment, causing opening movement of said pair of clamp arms in unison with each other while said clamp arms are in respective synchronized positions relative to each other.

2. The apparatus of claim 1 wherein said hydraulic circuit is capable of causing said closing

movements and opening movements interchangeably with respect to said pair of clamp arms.

3. The apparatus of claim 1 wherein said
5 hydraulic circuit includes a fluid flow limiter connected to said actuators capable of limiting relative movement between said pair of clamp arms.

4. The apparatus of claim 3 wherein said
10 fluid flow limiter is capable of limiting fluid flow which moves said other of said pair of clamp arms during closing movement thereof while said clamp arms assume said respective unsynchronized positions relative to each other.

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5. The apparatus of claim 3 wherein said
fluid flow limiter is capable of limiting fluid flow which moves said other of said pair of clamp arms during opening movement thereof so as to cause said attainment
20 by said clamp arms of said respective synchronized positions.

6. The apparatus of claim 1 wherein said
hydraulic circuit includes a fluid flow regulator,
25 connected to said actuators, capable of causing respective proportional fluid flows through said regulator to and from said actuators.

7. The apparatus of claim 1 wherein each of said fluid power actuators has a respective first conduit and second conduit, the first conduits of said actuators being joined in a first parallel connection to a clamp-closing fluid conduit and the second fluid conduits of said actuators being joined in a second parallel connection to a clamp-opening fluid conduit, at least one of said first and second parallel connections including a fluid flow regulator capable of causing respective proportional fluid flows through said regulator to and from said actuators, said hydraulic circuit further including a fluid bypass assembly associated with said fluid flow regulator enabling a bypass flow causing said opening movement of said other of said pair of clamp arms while said pair of clamp arms are in respective unsynchronized positions relative to each other.

8. The apparatus of claim 7 wherein said hydraulic circuit includes a pressure-responsive valve enabling said bypass flow while simultaneously preventing flow through said flow regulator.

9. The apparatus of claim 7 including a fluid flow limiter capable of limiting said bypass flow.

10. A load-handling clamp adapted to be mounted upon the lifting apparatus of a lift truck, comprising:

- 5 (a) a frame adapted to be mounted upon said lifting apparatus so as to be selectively movable vertically by said lifting apparatus;
- 10 (b) first and second opposing clamping assemblies mounted upon said frame, the first clamping assembly comprising at least a pair of clamp arms movable separately from each other relative to said frame selectively toward and away from the second clamping assembly;
- 15 (c) a pair of bidirectional fluid power actuators each capable of moving a respective one of said pair of clamp arms selectively either in a closing movement toward said second clamp assembly or in an opening movement away therefrom;
- 20 (d) each of said fluid power actuators having a respective first conduit and second conduit, the first conduits of said actuators being joined in a first parallel connection to a clamp-closing fluid
- 25 conduit and the second fluid conduits of said actuators being joined in a second

parallel connection to a clamp-opening
fluid conduit, at least one of said first
and second parallel connections including
a fluid flow regulator capable of causing
5 respective proportional fluid flows
through said regulator to and from said
actuators; and

(e) a fluid bypass assembly associated with
said fluid flow regulator enabling a
10 bypass flow causing opening movement of
one of said pair of clamp arms without a
proportional movement of the other of said
pair of clamp arms upon actuation of
opening movements of both of said pair of
15 clamp arms.

11. The apparatus of claim 10 wherein said
fluid bypass assembly is capable of enabling said bypass
flow interchangeably with respect to said pair of clamp
20 arms.

12. The apparatus of claim 10 wherein said
hydraulic circuit includes a pressure-responsive valve
enabling said bypass flow while simultaneously preventing
25 flow through said fluid flow regulator.

13. The apparatus of claim 10 including a fluid flow limiter capable of limiting said bypass flow.